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REFLECTION SEISMOGRAPH SURVEY BLACKWATER LAKE, GREAT BEAR RIVER AND OCHRE RIVER, NORTHWEST TERRITORIES 1961-62

Shell Oil Company of Canada, Ltd.,
Northern Division Exploration

June 6, 1962

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Permits #1960-1969 inclusive, #2143-2147 inclusive, #3112-3117 inclusive #1997-2011 inclusive, #1943-1948 inclusive, N/2 1949, #1950-1954 inclusive, E/2 #1955, #1956-1959 inclusive and S/2 #3222.

In compliance with Section 54(1), (2)b of the Canada Oil and Gas Land Regulations, the following is reported in regard to a geophysical exploration program performed on the subject permits and surrounding area.

Winter Program 1961-62

Location:

The prospect lies in unsettled country east of the Mackenzie River and centred about 90 miles north-northeast of Wrigley, N.W.T.

Work was conducted between latitudes 62°44' and 65°02' N and between longitudes 122°15' and 124°45' W.

Dates of Survey:

Seismic recording was conducted from December 6 to December 8, 1961 and January 3 to April 15, 1962 by a seismic crew contracted from from General Geophysical Company. The recorders were shut down during the period of February 11 to 19 in order that dozers and drills could establish a sufficient lead. A total of 90 recording days were involved.

Extent of Survey

Approximate Acreage	2,500,000
Miles of Traverse	415
Number of Shotholes	2,524
Access road bulldozed	142 miles
Seismic line bulldozed	420 miles

Field Conditions

The area was covered mainly by muskeg with some glacial deposits of till, sand and gravel. Elevations ranged from about 400 to 2,250 feet above sea level. The Franklin Mountains bounded the area on the west, otherwise the terrain was flat or gently rolling.

Available Roads:

A gravel road built for Northern Transportation Company was available along the south bank of the Great Bear River. About 25 miles south of this road and in the western part of the prospect, a winter road formerly used by dozer trains meandered southerly to the north end of Blackwater Lake. Elsewhere new trails had to be cut by dozers to provide access to program lines.

Weather:

Temperatures to a minimum of -56°F were recorded during the period of survey resulting in one day shutdown. Three other days were lost because of blizzard conditions. Above freezing daytime temperatures were common towards the end of the survey.

Field Procedure

Drilling

a. Near Surface Layers

Near Surface layers encountered during drilling included sandstone, shale, limestone, gravel, sand, clay, muskeg and permafrost. Clay and boulders were logged in a large number of the holes.

b. Hole Depth

Hole depth ranged from 10 feet to 100 feet. Shallow holes were common where drilling was very difficult, as in gravel and boulders; or where a hole drilled deeper could not be loaded because of sand. A few deep holes were drilled to 100 feet for record comparison. The most common hole depth used was 40 feet.

c. Drilling Equipment

Drilling equipment was supplied by sub-contractor C.W. Garrity and consisted of four truck-mounted Failing CFD1 drills equipped for air or water circulation. Two water trucks and three Power Wagons were also available. Drilling of shotholes were invariably done using air circulation. Both rock and insert type bits were used.

d. Drilling Problems

No serious drilling problems existed and only three drills were operated after February 27.

Recording

a. Type Shooting, Spread Length, Shooting Distance, Seismometer Interval, etc.

Seismic surveying was performed using the continuous profile method on a 24 trace recording unit. Shotpoints were located at the centre of 5280 foot instrument spreads consisting of 24 seismometer groups spaced 220 feet apart with the distance from the shotpoint to the closest station being 220 feet. Six seismometers at intervals of 25 feet were symmetrically arrayed about each station. The number of holes per shotpoint ranged from one to five. Generally, in shale one hole was used per shotpoint; on locations where clay and boulders were encountered, three holes were usually drilled per shotpoint with a spacing of 50 feet between holes.

b. Influence of Hole Depth

Holes were generally loaded to 40 feet. Deeper shots were attempted at the beginning of the survey but no improvement was noted in record quality. Shallow holes, less than 20 feet, usually did not provide enough energy.

c. Charges

Charges usually ranged from 5 to 10 pounds in each of the mult'ple holes used for reflection shooting.

d. Type Amplifier, Filter setting, etc.

General Geophysical type JMH amplifiers and Electro Tech type EVS 2 seismometers were used. Conventional squiggle recording was employed with a 1-33-75 filter and automatic volume control. On most

profiles a tap test was recorded to ensure that the cables were not reversed.

Surveying

Surveying was performed using a Wild T1A theodolite, and spreads were laid out using a calibrated chain. Vertical and horizontal control were obtained from a system of stations established by a tellurometer survey conducted by the Shell Oil Company of Canada, Limited.

Office Procedure

Weathering Corrections

First arrival surface to surface times were plotted on rectilinear paper for each profile shot. Apparently very little V_1 material (assumed to about 3,000 feet/second) was present. The lowest refraction velocity (V_2) indicated was generally about 6500 feet/second. The next velocity (V_3) recorded varied from 9100 to 13,000 feet/second. In some cases the V_2 velocity was absent, usually where shale was logged near the surface. Where this occurred the uphole time method of weathering corrections was used. Elsewhere the two layer method was used in determining weathering corrections.

$$Wc = tuh + \frac{Ds}{Vc} - \frac{K}{2}(T_2 - 2\ tuh)$$

where, tuh = uphole time

Ds - depth of shot

Vc - correction velocity (10,000'/sec.)

T_2 - intercept time of V_3 velocity

$$K = \frac{V_3 - V_2}{V_3 + V_2}$$

Cross Sections, Maps etc

Correlation of reflections were established on the best record obtained at each shotpoint. The customary weathering delay time and elevation correction to a datum plane of 1200 feet above sea level were applied at the shotpoint and at each recording station using a correction velocity of 10,000 feet/second. Each corrected reflection was then plotted in cross section profile using a wave front chart to remove the delta T. Initially the horizontal scale used on the cross sections was 1 inch = 600 feet surface distance. This was later changed to 1 inch = 1,000 feet. The vertical scale remained throughout at 1 inch = .100 second of two way time. Best fit lines were drawn through each plotted reflection giving the two way time at the shotpoint from datum to the particular reflection.

The reflections are graded as follows:

F - fair

P - poor

VP - very poor

NC - no correlation

NV - no value

NR - no reflections

NS - not shot

Grades are based on reflection character, amplitude and envelope.

Results

a. Quality

Records were generally fair except where the lines approached major rivers, eg. Line 1, or crossed the Franklin Mountains.

b. Maps submitted with this report include:

- Topography
- Hume
- Cambrian

GRAVITY SURVEY

In conjunction with the seismic survey a reconnaissance gravity survey was carried out along some of the seismic lines.

Equipment

A Worden gravity meter was used to record the gravity data. The operator carried out the survey using a truck during the extremely cold weather and a motorized tobaggan, a "ski-doo", during the later stages.

Computations

All gravity stations were tied together and corrected for instrument drift. In addition a latitude correction of 1.03 mgals/mile was applied together with a combined free-air and Bouguer elevation correction of .06599 mgals/foot, derived assuming an overburden density of 2.2 gms/cc. Because no accurate topographic maps exist for the area no terrain correction could be applied, however, since the area is generally quite flat this should introduce no significant errors.

Accuracy of the results is estimated to be between 0.5 and 1.0 mgals.

Maps submitted include:-

a. Locations and elevations of the gravity stations.

b. Contoured map of the corrected gravity values.

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